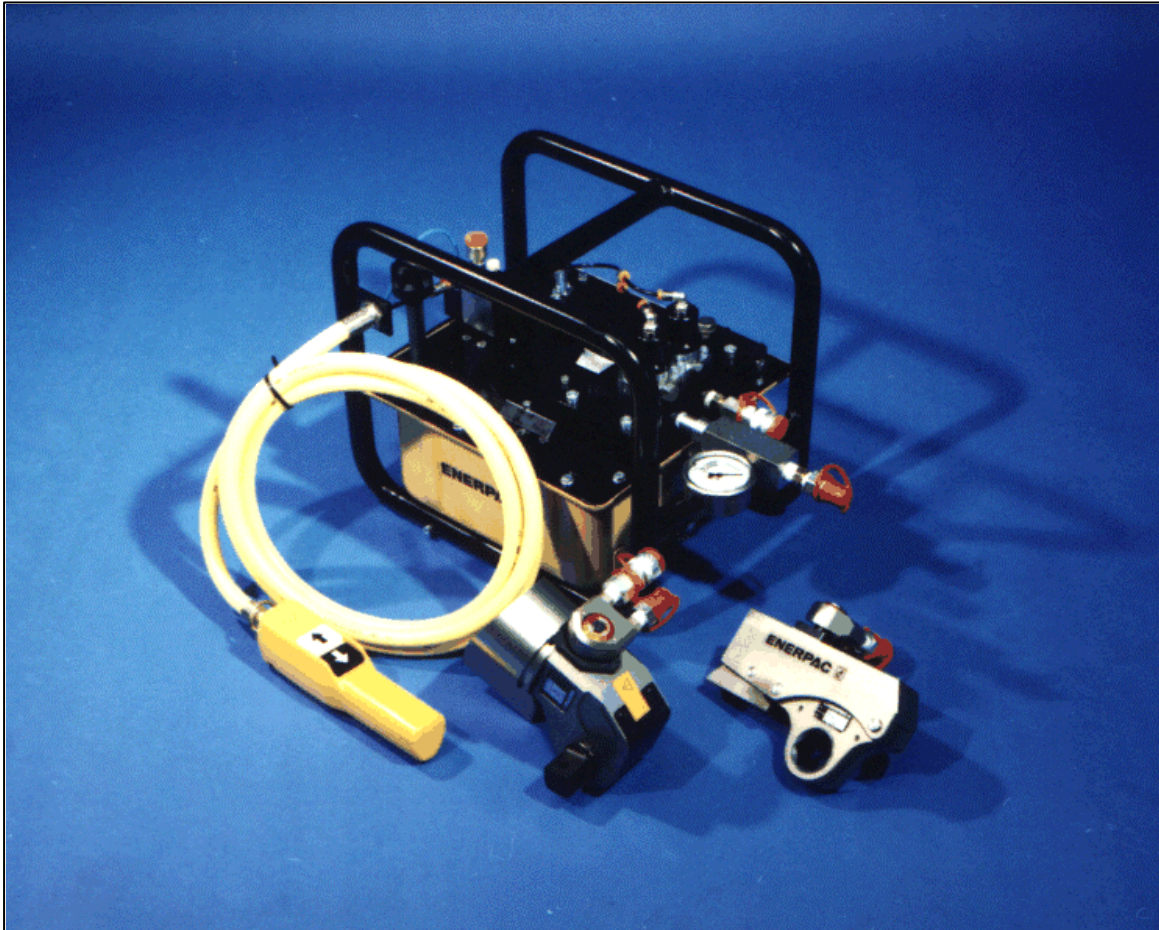


Subsea Torque Wrench System



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Introduction

The Torque Wrench system has been developed for use on topside applications where speed reliability and simple operation are essential. They are hydraulically operated tools being connected to a hydraulic pump via hydraulic hose assembly.

The tensioning tool comprises of either a Torque Wrench & Socket on standard square drive models or a Torque Wrench Drive Unit and Cassette Head on Low Profile Models. In each case the Socket or Cassette Head is located over the bolts nut. Pressure is applied to the wrench via the pump unit, downline mounted on a hosereel assembly and subsea control valve. A torsional force is generated and transmitted through the socket or Cassette Head and turns the nut down the helix of the thread, which in turn creates a clamping force on the joint. The nuts are tightened in a set sequence to provide a uniform load over the joint. On completion the torque wrench, subsea control valve and downline are recovered to the surface.

Safety Notes

The Torque Wrench system must only be used for the purpose for which it is intended. That is the tightening and loosening of stud assemblies. The tools should not be used for any other purpose or modified or adapted to other application without prior consultation with B & A Hydraulics. The following safety notes are not an exhaustive list but serve to provide a framework for considerations to be observed whilst using the equipment.

1. Read the operating instruction manual
2. Always wear personal protective equipment - eye protection is essential
3. Never position your hand under the wrench's reaction arm
4. Never position yourself in-line with a bolt being torqued
5. Never exceed the equipment's stated maximum working pressure
6. Do pressurise UN-COUPLED male 'Quick Disconnect Couplings'.
7. Never attempt to tighten or loosen any part of the hydraulic system while it is still under pressure.
8. If in doubt - ASK.

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Preliminary System Checks

Prior to using any B & A Hydraulics Torquing Equipment ensure the following requirements have been met:

TORQUE WRENCH - See Appendix 1

The correct size of Torque Wrench has been selected for the application.

The correct size of Socket / Insert has been selected for the nut

The Torque wrench is in the correct mode for tightening / loosening

The Correct length of Stud is protruding from the bolt's nut.

HOSE WHIPS - See Appendix 2

The Hoses are in good condition and have not incurred any damage. Look for any crushing, cuts or kinks in the hose.

A set of hoses are provided to connect the Pump Unit to the Hosereel and another set is provided to connect the Subsea Control Valve to the Torque Wrench

HOSEREEL - See Appendix 3

The Hosereel has sufficient hose length for your application.

The Hosereel is in good condition and has not incurred any damage.

AIR DRIVEN PUMP - See Appendix 4

The pump unit reservoir is filled with hydraulic oil.

There is an air supply capable of delivering 100 - 120 PSI @ 56 C.F.M available.

The pump unit is in good condition and has not incurred any damage.

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Flange Checks

Prior to Bolt Tensioning ensure the following Flange Checks have been made.

Flanges

The Flanges to be tensioned are the correct mating flanges

Both Flanges are free from damage

Both Flange faces are clean and free from debris

Gaskets

The correct Gasket has been selected

The Gasket is free from damage

Stud Bolts

The correct number and size of Stud Bolts for the flange have been selected

Each Stud Bolt has one drilled and one plain nut.

Both the Stud Bolts and nuts are free from damage.

On completion of the above checks the flanges are ready for assembly.

Flange Assembly

Pull the flanges together using B & A Hydraulics Hydraulic Flange Pullers until there is a gap of approximately 2 1/2 - 3 inches.

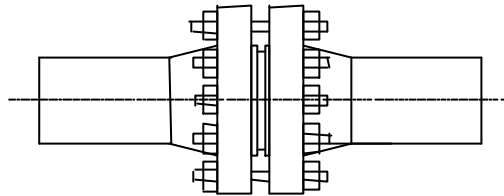
Insert the Gasket

Continue to pull up the flanges using the Flange Pullers until the flanges are firmly together and the gasket seated.

Insert the stud bolts in 4 opposite facing bolt holes i.e. at 12, 3, 6 & 9 o'clock, and hand tighten the nuts.

Remove the Flange Pulling Equipment.

Insert the remaining bolts as per diagram below.



Ensure the stud bolts do not have extra length protruding as this will not allow the Sockets to be fitted. If long stud protrusion is unavoidable then use a low profile tool & cassette head.

Perform a 'snugging pass' on all bolts as above.

Check the Flange gap is even by taking measurements at 12, 3, 6 & 9 o'clock positions.

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System Set-Up

Set Up - Topside

Pump Unit - Setting the Stall Pressure:

Connect air supply line to the air line connection (1/2" NPT female).

Ensure the pump unit is unconnected or connect a Hose Whip to the Female Coupling on the pump outlet, ensure hose whip has either a Female High Pressure Coupling or Blanking Plug fitted.

Ensure the Air On /Off valve is in the closed position and that the Hydraulic Pressure Release valve is fully open (turn anti-clockwise).

Lift the knob on the air pressure regulator and reduce air pressure to zero (turn adjusting knob anti-clockwise.)

Fully open the Air On / Off valve and slowly turn the air pressure regulator knob clockwise the air pressure is indicated on the air pressure gauge.

Close the Pressure Release Valve and pressure will build up. This will be indicated on the Pressure Gauge, continue to increase the air pressure until the required pressure is shown on the Pressure Gauge.

Close the Air On /Off valve. Pressure will at this point be held constant at the 'Stall Pressure'.

Release the pressure from the pump by slowly opening the pressure release valve, this will allow the hydraulic oil to return to tank.

The pump unit is now ready for use.

To operate the pump, close the Hydraulic Release valve, and open the Air On / Off valve the pressure will begin to rise.

When the required pressure is reached shut the Air On / Off valve and the pressure will be held.

Release the pressure by opening the Hydraulic Release valve.

NOTE:

The Air On / Off Valve has two operational positions:

- A jog position which springs to the close position when it is released
- The run position which locks open for continuous running

Set up Subsea

Place the Torque Wrench c/w Socket / Insert over the nut to be tightened.

Connect the Downline to Subsea Control Valve.

Connect the subsea control valve to the Wrench via the twin hoses.

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System Operation

Make-up

Operate the pump unit to the operating pressure for Pass 1

Move the valve handle on the Subsea Control Valve Clockwise. - This will advance the wrench and tighten the nut.

Once the torque wrench is fully advanced (the socket stops turning), place the valve handle in the opposite position to retract the wrench.

Once the wrench is fully retracted place the valve handle in the advance position to continue tightening the nut. Repeat this until the nut is fully tightened.

Repeat this procedure on each nut (following the star pattern).

Once all the nuts have been tightened, place the valve handle in the centre position. Stop the pump, release the pressure and set it to stall at the 2nd Pass pressure.

Repeat the above procedure for passes 2, 3 & 4.

On completion stop the pump and release the pressure.

Disconnect the Torque Wrench from the Subsea Control Valve, disconnect the Subsea Control Valve from the Downline and recover them all to the surface.

Break Out

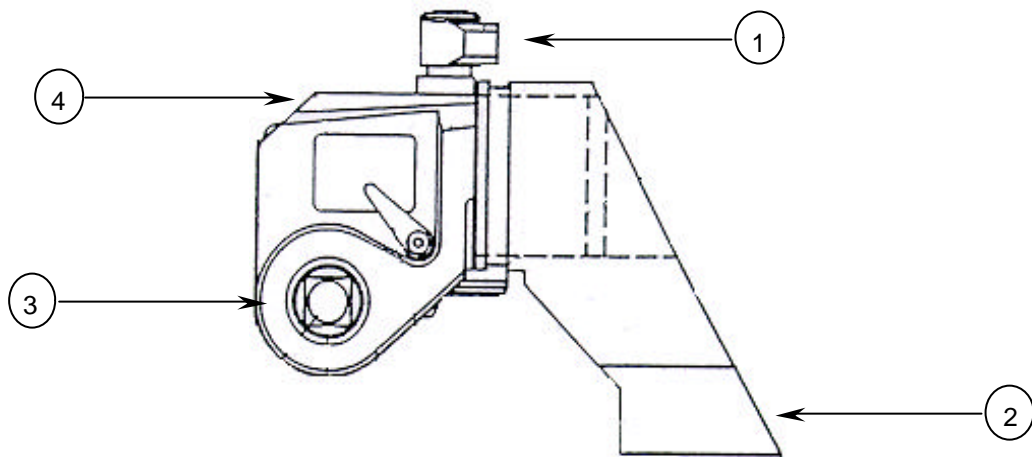
To break out nuts set the wrench to loosening position.

Set the pump to stall at the break out pressure.

The same procedure is used other than only 1 pass is usually required.

Appendix 1 - Torque Wrench

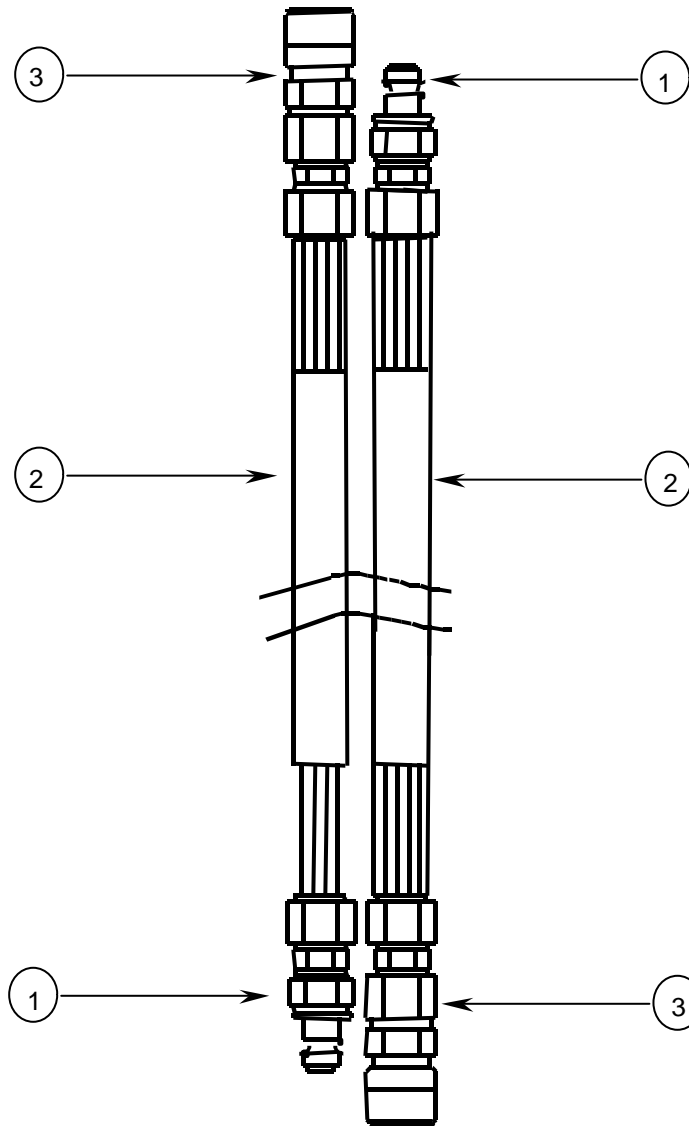
Item No	Description	Qty
1	Uni- Swivel Coupling Connector c/w Q/D Fittings	1
2	360 Degree rotational Reaction Arm	1
3	Square Drive or Low Profile Head Attachment	2
4	Tool Body	1



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Appendix 2 - Twin Hose Assembly

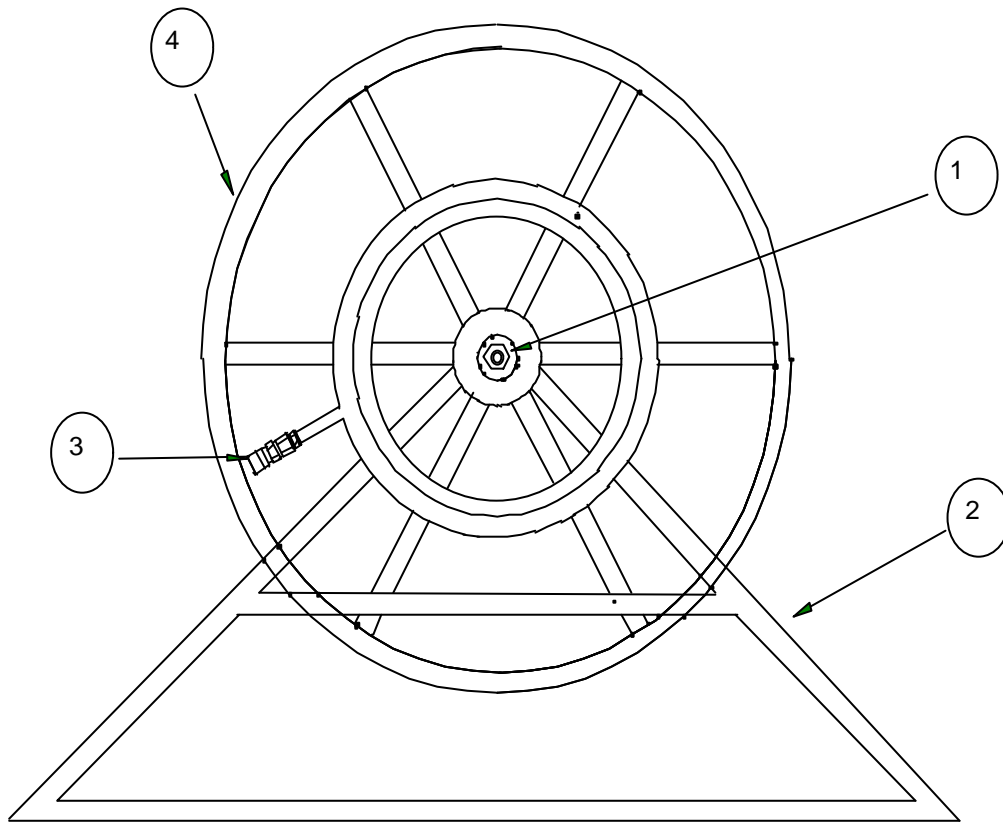
Item No	Description	Qty
1	Male Q/D Coupling Assembly	2
2	Twinned Hose 10,000 Psi MWP Hose	2
3	Female Q/D Coupling Assembly	2



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Appendix 3 - Twin Hosereel

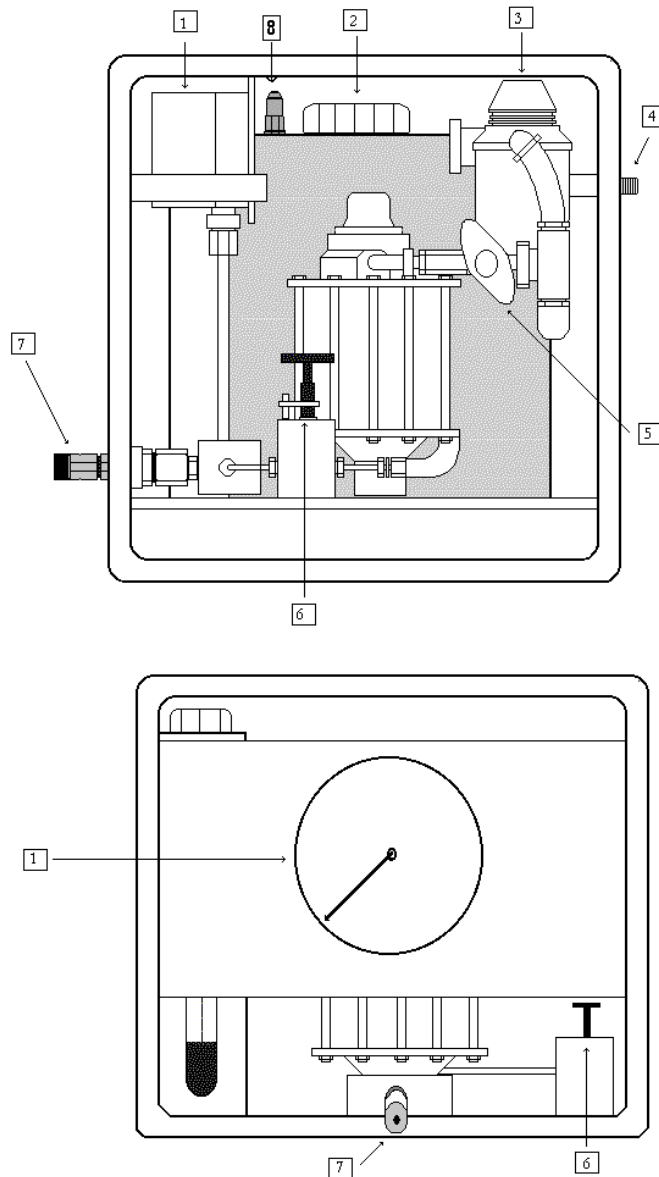
Item No.	Description	Qty
01	Inlet Manifold Block comprising 1 x Cejin 116 Series Nipple Assembly 1 x Cejin 116 Series Coupler Assembly	1
02	Reel Stand	1
03a	Cejin 116 Series Coupler Assembly	1
03b	Cejin 116 Series Nipple Assembly	1
04	Reel c/w 210m Twin D/Line - 30m hose lengths as standard	7



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Appendix 4 - Pump Unit

Item No	Description	Qty
1	Pressure Gauge	1
2	Pump Reservoir Filler	1
3	Air Pressure Regulator	1
4	Air Line Connection (1/2" NPT female)	1
5	Solenoid Valve System	1
6	Hydraulic Release Valve	1
7	Coupling Manifold (Cejin 116 Series Coupling)	1
8	Return To Tank Connection (Cejin 116 Series Nipple)	1



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